Supporting documents

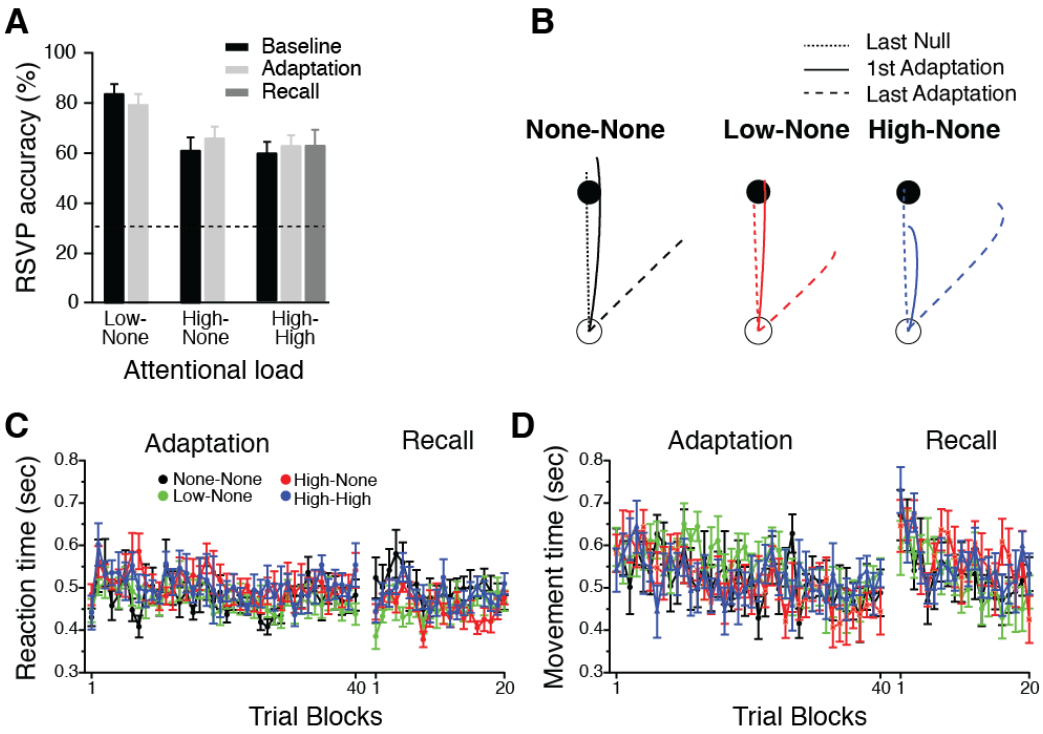

Figure S1: Performance in the RSVP and reaching tasks in Experiments 1 (N = 9 in each group). **A**: RSVP accuracy for the Low-None, High-None, and High-High groups. The dotted line indicates chance level (33%). The Low-None group had higher accuracy than the High-None group during the baseline and adaptation phases, which was confirmed by a two-way ANOVA with factors of Group (Low-None, High-None) and Phase (baseline, adaptation). There was a significant main effect of Group ($F(1, 16) = 15.67$, $p = 0.001$, $\eta^2p = 0.5$), no significant main effect of Phase and no interaction ($F(1, 16) = 0.06$, $p = 0.82$, $\eta^2p = 0.004$ and $F(1, 16) = 3.46$, $p = 0.08$, $\eta^2p = 0.18$, respectively). Performance in the High-High group was indistinguishable to that of the High-None group. There were no significant main effect of Group ($F(1, 16) = 0.23$, $p = 0.64$, $\eta^2p = 0.1$), Phase ($F(1, 16) = 1.45$, $p = 0.25$, $\eta^2p = 0.08$) or interaction ($F(1, 16) = 0.03$, $p = 0.86$, $\eta^2p = 0.002$). Critically, in Low-None, High-None, and High-High groups, equivalent performance during the baseline, adaptation, and recall phases (for the High-High group) indicated that performing the adaptation task did not interfere with performance of the RSVP task. **B**: Reaching trajectories. Movement trajectories for three representative participants of the None-None (left), Low-None (middle) and High-None (right) groups, respectively for the last trial of the baseline phase, 1st trial of the adaptation phase and last trial of the adaptation phase. **C**: Reaction time for the Low-None, High-None, and High-High groups. We analyzed the data using a two-way ANOVA with group (None-None, Low-None, High-None, High-High) as a between-subjects factor and block (all blocks within a phase) as repeated measures. RT did not differ across the all four groups during either adaptation or recall phase ($F(3, 32) = 1.19$, $p = 0.33$, $\eta^2p = 0.10$., and $F(3, 32) = 1.79$, $p = 0.17$, $\eta^2p = 0.14$, respectively). However, RT decreased across block during each phase although only marginally for the Recall phase ($F(39, 1248) = 4.15$, $p < 0.0001$, $\eta^2p = 0.11$, and $F(19, 608) = 1.49$, $p = 0.08$, $\eta^2p = 0.04$, respectively) without significant interaction effects ($F(117, 1248) = 0.76$, $p = 0.97$, $\eta^2p = 0.07$ and $F(57, 608) = 1.21$, $p = 0.14$, $\eta^2p = 0.01$, respectively). **D**: Movement time for the None-None, Low-None,

High-None, and High-High groups. MT during the adaptation phase did not differ across group during either adaptation or recall phase ($F(3, 32) = 0.98$, $p = 0.42$, $\eta^2p = 0.09$ and $F(3, 32) = 0.58$, $p = 0.63$, $\eta^2p = 0.05$, respectively), but significantly decreased across block ($F(39, 1248) = 1.89$, $p < 0.0001$, $\eta^2p = 0.09$ and $F(19, 608) = 2.35$, $p = 0.001$, $\eta^2p = 0.07$, respectively) without any significant interaction effect ($F(117, 1248) = 1.02$, $p = 0.43$, $\eta^2p = 0.09$ and $F(57, 608) = 0.78$, $p = 0.88$, $\eta^2p = 0.007$, respectively). In summary, similar patterns of RT and MT across groups and phases indicate that our findings are not confounded by potential speed-accuracy trade-off difference across groups. Error bars represent SE.

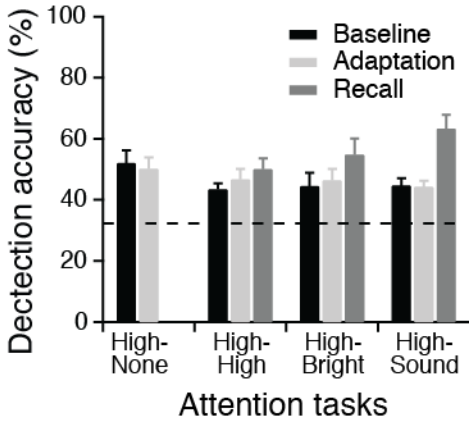

Figure S2: RSVP accuracy for the High-None, High-High, High-Brightness, and High-Sound groups (mean ± SE, N = 10 in each group) in Experiment 2. The dotted line indicates chance level (33%). We first analyzed the baseline and adaptation phases across all groups, since they all performed a dual-task. We found no significant effects of Group, Phase or interaction ($F(3, 36) = 0.16$, $p = 0.92$, $\eta^2p = 0.01$, $F(1, 36) \cong 0$, $p = 0.98$, $\eta^2p = 0.0001$, $F(3, 36) = 1.37$, $p = 0.27$, $\eta^2p = 0.12$). Next, we analyzed separately each of the High-High, High-Brightness, and High-Sound groups across the three phases. There were no differences across Phase for the High-High group ($F(2, 18) = 2.12$, $p = 0.15$, $\eta^2p = 0.19$), a marginally significant effect for the High-Brightness group ($F(2, 18) = 2.99$, $p = 0.08$, $\eta^2p = 0.25$) and a significant Phase effect for the High-Sound group ($F(2, 18) = 10.9$, $p = 0.0008$, $\eta^2p = 0.56$) du to higher accuracy during the Recall phase.

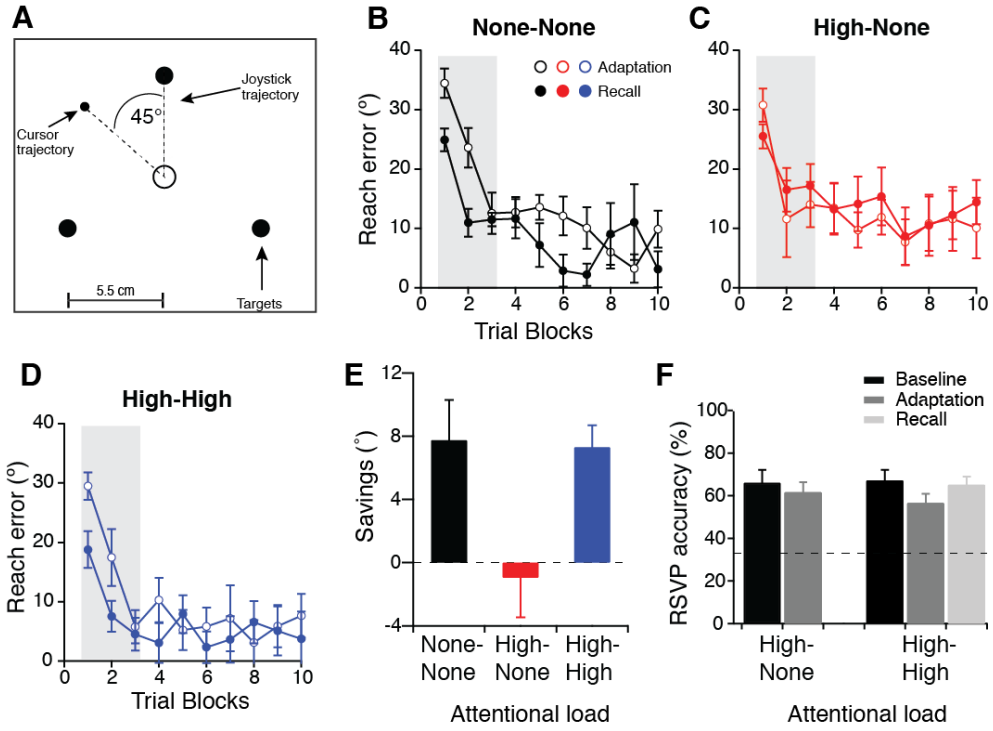

Figure S3: Task schematics (**A**), reach error (**B-D**) during the visuomotor adaptation task (averaged over blocks of 4 trials; mean ± SE; N = 10), savings (**E**), and RSVP accuracy (**E**) in within-participant experiment. **A**: Task schematics. Experimental procedures were the same as in Experiment 1 except for a few exceptions. Each participant performed the None-None, High-None, and High-High conditions in a random order. Within each condition, targets appeared at a single location either at 0, 4 or 8 o'clock, which was randomized across three conditions. In each condition, participants performed the baseline (20 null trials), adaptation (40 rotation trials), de-adaptation (40 null trials), and recall (40 rotation trials) phases. To minimize the carry-over effect across conditions, cursor rotation in rotation trials was randomly selected between 45º CCW or 45º CW across blocks and additional de-adaptation phase (40 null trials) was required after the recall phase. **B-D:** Reaching error during the adaptation open circle) and recall phases (solid circle) for the None-None (B), High-None (C), and High-High conditions (D). Gray areas in each figure indicate which blocks were used to calculate savings. In all three tasks during the adaptation phase, participants decreased error equivalently as confirmed by a significant main effect of Blocks ($F(9, 81) = 15.55$, $p < 0.0001$, $\eta^2p = 0.63$) no significant main effect of Tasks ($F(2, 18) = 0.66$, $p = 0.53$, $\eta^2p = 0.06$) and no significant interaction ($F(18, 145) = 1.39$ $p = 0.14$, $\eta^2p = 0.12$). **E:** Savings for the None-None, High-None, High-High conditions. We replicated Experiment 1 in which the magnitude of savings was significantly higher for the None-None, High-High than for the High-None group ($F(2, 18) = 4.3$, $p = 0.03$, $\eta^2p = 0.32$). **F:** RSVP accuracy for the Low-None, High-None, and High-High groups. The dotted line indicates chance level (33%). A two-way ANOVA with conditions (High-None and High-High) and Phases (baseline, adaptation) revealed no significant main effects of Tasks, Phases or interaction ($F(1, 9) = 0.19$, $p = 0.68$, $\eta^2p = 0.02$; $F(1, 9) = 3.69$, $p = 0.09$, $\eta^2p = 0.29$; $F(1, 10) = 1.20$, $p = 0.30$, $\eta^2p = 0.11$, respectively).